

Shock Tube Detonator Examinations

1 Scope

These procedures describe the process for shock tube initiation systems examinations and apply to explosives and hazardous devices caseworking personnel who examine shock tube initiation systems and their post-blast remains to determine identifying and functionality information.

2 Introduction

Shock tube initiation systems are high explosive accessories used in commercial blasting operations to connect more than one quantity of explosives (i.e., shots) to another quantity of explosives to ensure the simultaneous initiation of all the charges. It is utilized to initiate charges, in conjunction with a detonator or a mechanical shock tube initiator, where the use of an electrical detonator is not warranted. In functioning, the tube propagates a shock front, through the interior of the tube without fragmenting it, to initiate a non-electrical type of detonator which, in turn, initiates a shot, another length of shock tube, or a length of detonating cord.

Shock tube initiating systems resemble a length of colored or clear plastic tubing. They are constructed with a very small quantity of high explosive coating the interior of a hollow plastic tube. A non-electric detonator is usually factory attached to one end of the tube. Shock tube initiating systems are identified as to a specific manufacturer and brand, or type, from its external appearance and/or examination of construction characteristics.

Shock tube initiating systems are used in the construction of an improvised explosive devices (IEDs) as an accessory, when used in conjunction with a high or low explosive main charge or, separately, as the main charge explosive material in the IED.

Through an examination of shock tube, or its fragmented remains, its functionality within the IED and manufacturing information can sometimes be determined. This data can provided the investigator lead information which can facilitate the identification of the subject(s) and/or group responsible for constructing the device.

3 Equipment/Material/Reagents

Below is a list of items that can be used to examine shock tube initiation systems and their post-blast remains. Explosives and hazardous devices personnel should choose the most appropriate items based on the nature of the evidence.

- Personal Protective Equipment (e.g., lab coat, eye protection, full face shield, gloves)
- Hand tools (e.g., tweezers, pliers, utility knife)
- Cleaning materials and disinfectants (e.g., cloths, bleach, rubbing alcohol)

- Stereomicroscope (various magnifications)
- Ruler (e.g., standard 12 inch length)
- Micrometer
- Caliper
- X-ray machine
- Detonator inerting machine
- Pillboxes, glass containers, static-proof plastic bags
- FBI Laboratory Explosives Reference Tool (EXPeRT) Database
- Reference texts, manuals, manufacturers' literature, and known materials are maintained in the Explosives library. Additional reference information can be obtained from direct contact with manufacturers and distributors.

4 Standards and Controls

Not applicable.

5 Sampling or Sample Selection

Not applicable.

6 Procedures

These procedures are implemented as part of the overall examination process outlined in the Device Examinations Standard Operating Procedure (SOP). Refer to the Safety section of this SOP before starting any examinations.

Explosives and hazardous devices personnel will:

6.1 Before any examination is conducted, ensure that the item(s), as well as its container(s) and packaging, have been appropriately marked in accordance with the *FBI Laboratory Operations Manual (LOM)* (i.e., item number, initials, and full Laboratory number, when practicable).

6.2 Ensure care is taken not to obliterate any identifying marks which have been previously placed on the item(s), or obliterate any microscopic marks of value.

6.3 Visually examine the item(s) for any trace evidence that could be of value. This evidence could include, but not limited the following: hairs, fibers, blood, paint, or other particles.

6.3.1 If trace evidence is to be examined or preserved, contact the appropriate unit and determine if the material should be removed. Record the presence of the material by means of notes, sketches, or photographs before it is removed.

6.4 Note the physical characteristics of the shock tube through visual/microscopic examination. Physical measurements should be taken as well to aid in determining as many of the following attributes as possible:

- Construction characteristics
- Manufacturer
- Brand
- Type
- Special properties (e.g., physical condition, functionality, modifications made for use in IED)

6.5 If possible, determine the manufacturer, brand, and type by searching the EXPeRT data base, Explosive reference files, manufacturers' literature, and/or reference or known materials collection. Identifications are made by comparison of observable/measurable physical characteristics with those provided in the above reference/literature materials.

7 Calculations

Not applicable.

8 Measurement Uncertainty

Not applicable.

9 Limitations

Refer to the Limitations section in the Device Examinations SOP and Appendix B of the Explosives and Hazardous Devices Report Writing Guidelines SOP.

10 Safety

Safety protocols, contained within the FBI Laboratory Safety Manual, will be observed at all times.

10.1 Shock tube initiating systems should be protected from sources of heat, shock, and friction. Should a shock tube initiating system be accidentally initiated, it has the capability of inflicting personal injury or death; therefore, it should be handled with care. Personnel should follow the below guidance regarding the handling of shock tube initiating systems:

10.1.1 When not under examination, the shock tube initiating systems will be stored in approved, explosion-proof containers (e.g., MK663 container, explosive magazines)

10.1.2 Shock tube initiating systems will be shipped in Department of Transportation (DOT) approved containers (e.g., MK663 containers).

10.1.3 The detonator of shock tube initiating systems will be rendered safe, or inert, by using specialized equipment (e.g., detonator inerting machine).

10.1.4 Appropriate facial protection (e.g., eye protection, full face shield) will be worn when handling these materials.

10.1.5 Shock tube initiation systems will not be examined at the same time that other explosives are being examined.

10.2 Protective gloves (e.g., latex, nitrile) must be worn when handling items that have been possibly exposed to blood, tissue or other bodily fluids. Gloves will prevent exposure of personnel to possible hazardous material on items and prevent DNA from being transferred to the items.

10.3 Items potentially bearing blood or other body fluids will be disinfected with a 2.5% bleach solution or other suitable disinfectant following discussions with personnel that may conduct other examinations of the items.

11 References

FBI Laboratory Division

FBI Laboratory Quality Assurance Manual, Federal Bureau of Investigation, Laboratory Division, latest revision.

FBI Laboratory Operations Manual, Federal Bureau of Investigation, Laboratory Division, latest revision.

FBI Laboratory Safety Manual, Federal Bureau of Investigation, Laboratory Division, latest revision.

Explosive Devices SOPs, Federal Bureau of Investigation, Laboratory Division, latest revisions.

Other

International Society of Explosives Engineers, Blasters' Handbook, 18th Edition, 2011

Persson, P.A., Rock Blasting and Explosives Engineering, CRC Press, 1994

Thurman, J.T., Practical Bomb Scene Investigation, 2nd Edition, CRC Press, 2011

Rev. #	Issue Date	History
0	07/07/2006	Original Issue to follow QATU formatting and ASCLD/LAB-International requirements
1	10/02/2017	Administrative changes for grammar, clarity, and conformance to revised QAM and LOM. Removed references to the Explosives Unit to applicability to those conducting explosives and hazardous devices related examinations. Deleted Calibration section since it is no longer required. Updated Limitations section to refer the reader to the Device Examination SOP and Appendix B of the Explosives and Hazardous Devices Report Writing Guidelines SOP. Updated references.

Approval

Redacted - Signatures on File

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